



# Fruit Times

*Events in the orchard that matter to you.*

Horticulture, Entomology, and Plant Pathology Departments. The Pennsylvania State University



## Pennsylvania Tree Fruit Production Guide Supplement

# COOKBOOK GUIDELINES FOR APPLE TRAINING SYSTEMS

*Rob Crassweller, Jim Schupp and Tara Baugher*

### Vertical Axe

#### *At Planting*

Remove all scaffolds below 18 inches, flush to the trunk. Trees with less than 3 branches should be headed at 30 inches and all feathers (scaffold branches) removed with a bevel or Dutch cut. Attach trees to the support system as soon as possible. Trees with 3 or more branches offer three options depending upon the vigor of the scion and rootstock. Always remove any scaffolds that are more than 1/2 the diameter of the central trunk. The alternatives in order of low vigor to high vigor are:

Option 1: Head leader 10 to 12 inches above the uppermost branch and all branches by 1/3.

Option 2: Head leader 10 to 12 inches above the uppermost branch and DO NOT head the side branches.

Option 3: DO NOT head leader or side branches.

#### *1<sup>st</sup> Growing Season*

*May:* Rub off 2 or 3 competing buds below the chosen leader if you headed the tree back at planting.

*June:* Clothespin new shoots when they are as long as, or just longer than, the clothespin. (Remember to remove clothespins in August.)



*Clothespin Training*



#### *2<sup>nd</sup> Leaf*

DO NOT head the leader or prune the tree in the dormant season. If additional scaffolds are needed, notch above desired buds in the late dormant season (4 to 6 weeks before bud break) or apply Promalin mixed with latex paint.

*June:* When 3 to 6 inches of new growth develops on shoots above the main scaffolds pinch the new growth back by 1/3 their length. Position permanent scaffolds horizontally utilizing weights, elastics or string. Position vigorous shoots below horizontal by means of weights, elastics or string.

*July:* Re-pinch all laterals as outlined above, as needed. If tree is vigorous it may be necessary to pinch the shoots a third time in August.

### *3<sup>rd</sup> Leaf*

DO NOT HEAD THE LEADER or prune the tree in the dormant season. Tie down vigorous upright limbs below horizontal.

*June:* When 3 to 6 inches of new growth has developed on shoots in the top 1/3 of last year's central leader, pinch them back by 1/3 to 1/2 their length.

### *4<sup>th</sup> Leaf*

DO NOT HEAD THE LEADER. Prune out overly vigorous limbs that are of no use.

*June / July:* Position overly vigorous limbs below horizontal

**OR**

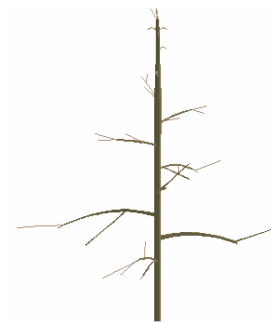
*August:* Summer prune, removing vigorous limbs, to maintain pyramid shape and improve light interception.

### *5<sup>th</sup> and Succeeding Years*

DO NOT HEAD THE LEADER. Shorten bottom tier scaffolds by pruning back to a side branch. If desired begin removing / renewing scaffolds by thinning out the ONE most vigorous limb. Leave all weak fruiting wood. Shorten pendulant branches back to a more horizontal position. Summer prune as needed in August to maintain light interception.

### *Final Leader Height*

The ideal situation is that the leader will bend with a crop to restrict the tree height. This is termed the "crop and flop" method. However, in some cultivars the leader does not bend, and the tree continues to grow upward. If this occurs you can cut the leader back to a lower more horizontal branch but only do so after the upper portion of the tree has fruited.



## **Spindle**

### *At Planting*

Remove all scaffolds below 18 inches, flush to the trunk. Trees with less than 3 branches should be headed at 30 inches and all feathers removed with a bevel or Dutch cut. Trees with 3 or more branches should be headed

12 inches above the top-most scaffold limb. Remove any feathers that are 1/2 or more the diameter of the central trunk. Attach trees to the support post or conduit as soon as possible.

### *1<sup>st</sup> Growing Season*

*May / June:* Select the most vigorous upright growing shoot that develops below the headed leader. Rub off 2 or 3 competing buds below the chosen leader. Clothespin new shoots that will become future scaffolds or tie down existing shoots to a more horizontal position using string, elastics or weights. (Remember to remove clothespins in August.)

### *2<sup>nd</sup> Leaf*

*Dormant:* Head the central leader on weak growing trees by removing 1/2 to 1/3 of previous year's growth. On very vigorous trees (over 20 inches terminal growth) remove the shoot and tie up a weaker leader from a branch below. Alternatively, vigorous leaders can be bent to a 90 degree angle or greater.

*June / July:* Rub off 2 to 3 competing buds below the leader if the tree was headed in the dormant season. Tie developing leader to the support post. Position overly vigorous limbs and shoots horizontally with weights. Tie up scaffolds that may bend under weight of fruit.

### *3<sup>rd</sup> Leaf*

*Dormant:* Head the central leader on weak growing trees by removing 1/2 to 1/3 of previous year's growth. On very vigorous trees (over 20 inches terminal growth) remove the shoot and tie up a weaker leader from a branch below.

*June / July:* Rub off 2 to 3 competing buds below the leader if the tree was headed in the dormant season. Install clothespins to spread new developing side shoots. Remove any vigorous vertical growing shoots. Position overly vigorous limbs and shoots horizontally with weights. Tie up scaffolds that may bend under weight of fruit.

### *4<sup>th</sup> Leaf*

*Dormant:* Remove overly vigorous leaders, and replace each with a suitable side scaffold. Reduce the length of scaffold branches that do not appear capable of supporting a fruit crop by cutting back to a side branch.

*August:* Summer prune if necessary to maintain pyramidal shape and to encourage light interception. Remove vigorous upright growing shoots.

### *5<sup>th</sup> and Succeeding Years*

Minimize winter pruning to renew vigorous scaffold limbs in the top half of the tree. Maintain tree height at 6 to 8 feet by cutting the leader to a weak side scaffold as needed to prevent excessive growth in the top of the tree. Remove pendant branches and spur complexes by cutting to a more horizontal shoot or spur system. Shorten bottom tier scaffolds as needed to maintain fruit quality by pruning back to a side branch.

## **Hybrid Tree Cone (HYTEC)**

### *At Planting*

Remove all scaffolds below 18 inches, flush to the trunk. Trees with less than 3 branches should be headed at 30 inches and all feathers removed with a bevel or Dutch cut. Trees with 3 or more branches should be headed 10 inches above the top-most scaffold. Attach trees to the support system as soon as possible.

*June:* Select one upright growing shoot from just below the headed leader, and rub off the other competing shoots or position them horizontally with clothespins. (Remember to remove clothespins in August.)

### *2<sup>nd</sup> Leaf*

*Dormant:* Bend and tie the leader into a horizontal position. OR remove the leader, and bend up a weaker more horizontal shoot.

*June:* If the leader was left intact and bent horizontally then return to the tree and bend and tie it horizontally in the other direction. Position lower scaffold limbs to a horizontal position with elastics, string or weights.

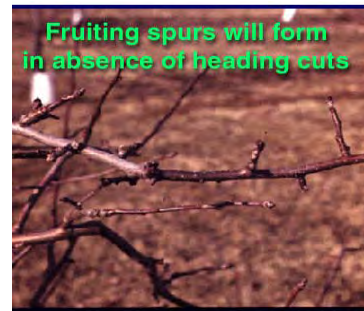
*3<sup>rd</sup> and 4<sup>th</sup> Leaf:* Repeat either bending or leader removal as outlined in 2<sup>nd</sup> leaf directions until the tree has reached 10 feet tall. Remove any vigorous upright growing shoots from lower branches.

### *5<sup>th</sup> Leaf and Succeeding Years*

**DO NOT HEAD THE LEADER.** Maintain tree height at 10 feet, if necessary by cutting the leader back to a horizontal branch. Do not head the replacement shoot selected. Shorten lower scaffolds that become pendulant by cutting to a side branch. Maintain short fruiting branches above the lower scaffolds by periodic renewal of the limbs.



*Dutch Cut*



*Benefit of Thinning Cuts*

### **Minimally Pruned**

#### *At Planting*

Remove all scaffolds below 18 inches, flush to the trunk. Trees with less than 3 branches should be headed at 30 inches and all feathers removed with a bevel or Dutch cut. Trees with 3 or more branches should not be headed but must be attached to the support system as soon as possible. Remove any feathers that are 1/2 or more the diameter of the central trunk.

*June / July:* New, developing shoots should be spread with clothespins when they are about as long as the length of the clothespin. Existing branches that were retained at planting should be bent to horizontal using weights, elastics or string. (Remember to remove clothespins in August.)

## *2<sup>nd</sup> Leaf*

*Dormant:* Head the central leader by 1/3, IF it is not growing vigorously (18 inches or more of growth). Remove any upright vigorously growing shoots with a flush cut. Position scaffold limbs to horizontal using weights, elastics or string.

*June / July:* New, developing shoots should be spread with clothespins when they are about as long as the length of the clothespin.

## *3<sup>rd</sup> Leaf*

*Dormant:* Head the central leader by 1/3, IF it is not growing vigorously (18 inches or more of growth). Remove any upright vigorously growing shoots with a flush cut. Position scaffold limbs to horizontal using weights, elastics or string.

## *4<sup>th</sup> and Succeeding Years*

DO NOT head the leader. Remove any low hanging branches, branches growing back into the center of the tree or vigorous vertical shoots, with a flush cut. Remove any broken branches with a flush cut. If you need to shorten a scaffold branch prune it back to a side shoot. DO NOT make any heading cuts into 1-year-old wood. Retain short fruiting wood in the upper portions of the canopy. If tree height becomes excessive cut the top down to a horizontal branch that has fruiting spurs on it.

## **Central Leader (Dwarf Trees)**

### *At Planting*

Remove all scaffolds below 18 inches, flush to the trunk. Trees with less than 3 branches should be headed at 30 inches and all feathers removed with a bevel or Dutch cut. Attach trees to the support system as soon as possible. Trees with 3 or more branches offer three options depending upon the vigor of the scion and rootstock. Always remove any scaffolds that are more than 1/2 the diameter of the central trunk. The alternatives in order of low vigor to high vigor are:

Option 1: Head leader 10 to 12 inches above the uppermost branch and all branches by 1/3.

Option 2: Head leader 10 to 12 inches above the uppermost branch and DO NOT head the side branches.

Option 3: DO NOT head leader or side branches.

### *1<sup>st</sup> Growing Season*

*May:* Rub off 2 or 3 competing buds below the chosen leader if you headed the tree back at planting.

*June:* Clothespin new shoots when they are as long as, or just longer than, the clothespin. (Remember to remove clothespins in August.)

## *2<sup>nd</sup> Leaf*

DO NOT head the central leader. Select 3 to 5 first tier scaffold branches of moderate vigor with wide crotch angles, and remove the rest. Care should be taken to attain good spacing of branches around the trunk, both radially and vertically. Scaffold branches that are evenly distributed around the tree will assure even light distribution, and scaffolds that are spaced out vertically will assure that leader dominance is maintained. If additional scaffolds are needed, notch above desired buds in the late dormant season (4 to 6 weeks before bud break), or apply Promalin mixed with latex paint.

*June:* Position permanent scaffolds at a 50 to 75 degree angle from vertical, utilizing spreaders, weights, elastics or string.

### *3<sup>rd</sup> Leaf*

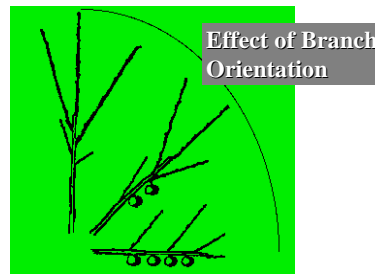
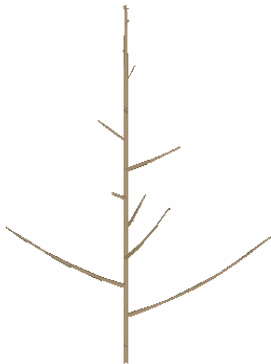
Head the central leader, removing 1/2 to 1/3 of previous year's growth. Thin out overly vigorous limbs that are of no use.

*June:* Position permanent scaffolds at a 50 to 75 degree angle from vertical, utilizing spreaders, weights, elastics or string. When 3 to 6 inches of new growth has developed in the top 1/3 of last year's central leader, select shoots to be the second tier scaffolds. Pinch out the most and least vigorous shoots leaving 3 to 4 of moderate vigor. Clothespin these second tier scaffolds to obtain wide crotch angles.

### *4<sup>th</sup> Leaf*

DO NOT HEAD THE LEADER. Prune out only overly vigorous limbs that are of no use.

*June / July:* Position first tier scaffolds at a 50 to 75 degree angle, and position second tier scaffolds horizontally utilizing spreaders, weights, elastics or string. Position overly vigorous limbs below horizontal.



### *5<sup>th</sup> and Succeeding Years*

DO NOT HEAD THE LEADER until it has bent over with a crop. Maintain good light distribution by making a minimal number of thinning cuts. Continue to position scaffold limbs with spreaders until this function is replaced by the weight of a crop. Shorten bottom tier scaffolds by pruning back to a side branch. Shorten pendant branches back to a more horizontal position. Summer prune as needed in August to maintain light interception.

### *Final Leader Height*

The ideal situation is that the leader will bend with a crop to restrict the tree height. This is termed the "crop and flop" method. However, in some cultivars the leader does not bend and the tree continues to grow upward. If this occurs you can cut the leader back to a lower, more horizontal branch but only do so after the upper portion of the tree has fruited.

*Authors*

Dr. Rob Crassweller, Department of Horticulture

Dr. Jim Schupp, Department of Horticulture and Penn State Fruit Research and Extension Center

Dr. Tara Baugher, Capital Region Cooperative Extension

This publication is available in alternative media upon request.

The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-5901, Tel 814-865-4700/V, 814-863-1150/TTY.

Where trade names appear, no discrimination is intended and no endorsement by Penn State Cooperative Extension is implied.

